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OBSERVATIONS ON *MEDICAGO LUPULINA* L.

OWING to the occasional adulteration of alfalfa seed with yellow trefoil, *Medicago lupulina*, this plant is of considerable interest to alfalfa growers in the eastern states. It is encouraging to note that such adulteration is less common than formerly. Of 491 samples of alfalfa seed examined by the writer at the New York Experiment Station during the past eighteen months, only seven showed evidence of adulteration with yellow trefoil.

In botanical works *Medicago lupulina* is sometimes described as an annual and sometimes as "annual or biennial." Careful observation has shown that in alfalfa fields in New York it is regularly a biennial. Even when the seed is sown in spring only occasional plants blossom and seed the first year. The great majority do not bloom until the second year in the latter part of May, shortly before the first cutting of alfalfa. At this time the plants are very conspicuous because of their yellow blossoms; but they do not reappear in subsequent cuttings of the alfalfa.

That the plants actually do live over winter is proved by the results of the following experiment: On March 29, 1907, nine plants suspected of being *M. lupulina* were transplanted into the station greenhouse. Six of these were taken from an alfalfa field and three from a lawn on the station grounds. They all blossomed and proved to be as suspected.

Except when the two plants are in bloom, *M. lupulina* so closely resembles alfalfa, *M. sativa*, that the two species are distinguished with difficulty. This is especially true in the early stages of growth. The writer has sought unsuccessfully for morphological or anatomical characters by means of which the two species may be separated with ease and certainty. In early spring the most reliable characters by which the two species may be separated are, (1) the habit of growth of the crown and (2) the character of the root system. The crown of *M. lupulina* is spreading, very similar to that of red clover, and the stems are procumbent; while the crown of alfalfa is upright in habit. The root systems offer a more striking difference. Alfalfa has

a large tap-root with very few side roots. *M. lupulina* has a small tap-root nearly concealed in a mass of fibrous side roots.

In conclusion, it may be of interest to note the finding of a *M. lupulina* seedling having three cotyledons. G. T. FRENCH

NEW YORK EXPERIMENT STATION,
GENEVA, NEW YORK

SOCIETIES AND ACADEMIES

THE GEOLOGICAL SOCIETY OF WASHINGTON

At the 207th meeting of the society, on May 27, Mr. F. E. Matthes discussed informally "Refusion of Cinders by Camp Fires on San Francisco Mountains, Arizona." Mr. L. D. Burling also discussed briefly "Colored Photography in Geology."

Regular Program

The Coalinga, California, Oil Field: Mr. RALPH ARNOLD and Mr. ROBERT ANDERSON.

The Coalinga District is situated on the eastern flank of the Diablo Range, along the border of the central valley of California. This flank of the range is formed of an eastward dipping monocline that exposes the Franciscan (probably Jurassic) in the axis of the range and above this about 26,000 feet of strata representing a considerable portion of the time up to the middle Pleistocene. There are at least 12,000 feet of Cretaceous, including lower and upper Cretaceous, with a probable unconformity between, and 14,000 feet of Tertiary and Quaternary beds composing six mutually unconformable formations. These belong to the Eocene, lower Miocene, upper Miocene, Pliocene and lower Pleistocene. The youngest formation that has undergone folding comprises a thickness of at least 2,500 feet of unconsolidated coarse and fine sediments belonging to the Pliocene and lower Pleistocene, and has been correlated with the Paso Robles formation of the Salinas Valley. It is of freshwater origin at the base and in part marine above, but is thought to have originated in large measure subaerially as a filling in the Great Valley of California. Great orogenic movements took place in the Pleistocene and in places lifted the deposits forming the floor of the central valley into steeply dipping folds. These folds are topographic as well as structural arches and afford a rare instance of the preservation of the original domes due to warping of the surface.

The petroleum occurs in beds and lenses of sand and gravel in the Eocene, lower Miocene

and upper Miocene formations. The petroleum from the Eocene varies in gravity from 20° to 42° Baumé and the production is usually light, varying from 4 to 75 barrels per day per well. The lower Miocene oil sands are the most important in the field, yielding oil of 14° to 31° Baumé. Individual wells produce as high as 3,000 barrels a day from the lower Miocene sands. The upper Miocene is petroliferous in the western part of the field, yielding oil of from 14° to 22° Baumé. Wells penetrating this formation seldom yield more than 600 or 800 barrels a day.

Water occurs in the formation above the oil sands and in some instances sulphur water is interbedded with the petroliferous strata. Little "bottom" or "edge" water has been encountered in the field. The oil is believed to be derived from the organic materials in the Eocene shale. There are nearly 400 productive wells in the field, these varying in depth from about 600 to over 3,000 feet. The production for 1906 was 7,991,039 barrels. The product is marketed by rail and through two long-distance pipe lines, much of it being refined.

Laramie Formation: WHITMAN CROSS.

It has long been known that the Laramie of King and Hayden has been found to consist of two parts, a lower portion, corresponding to the original definition by King, which is conformable with the underlying Cretaceous section, and an upper portion, separated from the lower by a great unconformity and stratigraphic break in several localities. In earlier discussions of this question the author proposed to restrict the use of the term Laramie to such beds as constitute the upper conformable part of the Cretaceous section and to apply the term "Post-Laramie" in a tentative way to the group of formations separated from the Laramie by unconformity or stratigraphic break.

It has recently been ascertained by A. C. Veatch and others that the long-known formation at Carbon, Wyoming, on the Laramie Plains, is distinctly unconformable upon marine Cretaceous, no true Laramie beds being present at the best known exposures. Governed by the idea that the Carbon section is to be regarded as a type section of the Laramie, as defined by King, Mr. Veatch has proposed to restrict the term Laramie to the formations above the stratigraphic break up to the Fort Union formation. There are thus two directly opposing propositions for the use of the term Laramie. It is claimed by Mr. Cross that the term Laramie was not originally proposed

especially for strata of southern Wyoming, but as a practical synonym for the term lignitic, and embraced formations known in many places in Montana, Wyoming, Colorado and New Mexico. The definition of Laramie by King mentions no type section and lays emphasis repeatedly upon the conformity of the Laramie with the underlying Cretaceous section. The Laramie was supposed by King to end with the Rocky Mountain revolution, which he assumed to take place preceding the Wasatch epoch. Mr. Cross repeats the proposition previously made to restrict the use of Laramie in accordance with the fundamental relations specified in the original definition, rather than to correspond with the local conditions which exist in the Carbon section.

For the various local formations separated from the Laramie, as thus defined, by unconformity or stratigraphic break, and older than the Fort Union beds, Mr. Cross proposes that a new term should be adopted.

Among the formations to be referred to the new group are the Arapahoe, Denver, Middle Park, Animas, and other local deposits of Colorado; certain beds of Carbon, Evanston and the Converse County Ceratops beds of Wyoming; the Livingston and Hell Creek beds of Montana. Certain features of stratigraphy and paleontology were considered and their bearing upon the assignment of certain beds to the Laramie or to the new group in certain cases discussed.

The assignment of the group to the Eocene rather than to the uppermost Cretaceous is advocated by Mr. Cross on the ground that such a division is particularly appropriate viewed from the standpoint of historical geology. The paleontological evidence is not believed to require the assignment of this group to the Cretaceous, and, indeed, much of the evidence is conceived to be in favor of the reference proposed.

RALPH ARNOLD,
Secretary

THE AMERICAN CHEMICAL SOCIETY. NEW YORK
SECTION

THE ninth regular meeting of the session of 1907-8 was held at the Chemist's Club, on Friday evening, June 5.

Professor Charles F. Chandler addressed the section on "Silk: Natural and Artificial." The lecture was illustrated by stereopticon and by numerous samples of raw and finished silk products.

C. M. JOYCE,
Secretary